Advanced Space Power Systems (ASPS): High Specific Energy Li-ion Battery Cells

Completed Technology Project (2011 - 2014)

Project Introduction

The goal of this project element is to increase the specific energy of Li-ion battery cells to 265 Wh/kg and the energy density to 500 Wh/L at 10oC while maintaining safe operating margins. These goals will be demonstrated in large format commercial-grade cells to demonstrate the ability to scale-up the complex cell components under development in the laboratory.

The objective of the High Specific Energy Battery project element is to develop high specific energy battery technologies that enable new capabilities for future human space exploration and scientific missions. Several mission concepts require the large amounts of energy storage of and on-demand supply of high of power. Development of low-cost high-energy storage capabilities can fulfill the strategic goals for NASA, by developing radical, high-payoff technologies, and enabling missions otherwise cost and energy-prohibitive. The availability of abundant battery power will expand the capabilities of every human mission, including future missions to asteroids, planets, moons, libration points, and orbiting structures. Furthermore, abundant battery power provides benefits for all phases of spaceflight: vehicle operations, electric propulsion systems, and destination applications. The high specific energy battery technology included within this project element has been selected to fill technical gaps identified by NASA as critical for human exploration. Batteries have been identified as being critically important for a variety of elements and missions being studied by NASA's Human Spaceflight Architecture Team (HAT), and address needs described in the Office of the Chief Technologist's Space Technology Roadmaps specifically: Space Power and Energy Storage Technologies (TA-03). The technology development within this project element aims to provide the best combination of reliable and power for low mass, volume and /or cost, with safe operation within human systems a paramount objective. The main focus of the project element will be to develop space qualified batteries that exceed key performance parameters for exceeding specific energy goals of > 200 Wh/Kg and energy density goals of > 460 W/liter at the cell level. Meeting and/or exceeding these key performance parameters will allow for extending current EVAs (Extra Vehicular Activities) missions by an hour (Typical EVA's performed on ISS normally do not exceed 5 hours in duration.), while reducing EVA battery mass by 20%. At the conclusion of this project element critical battery sub-system technologies, currently at TRL 2/3 (i.e. battery cell level) will be demonstrated at TRL 4/5 by the end of FY14, while establishing novel components that when integrated into a battery assembly have the capability provide approximately 7-hours of continuous power for EVA's.

Anticipated Benefits

Extended EVA time (to 8 hours)

Advanced Space Power Systems (ASPS): High Specific Energy Li-ion Battery Cells

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

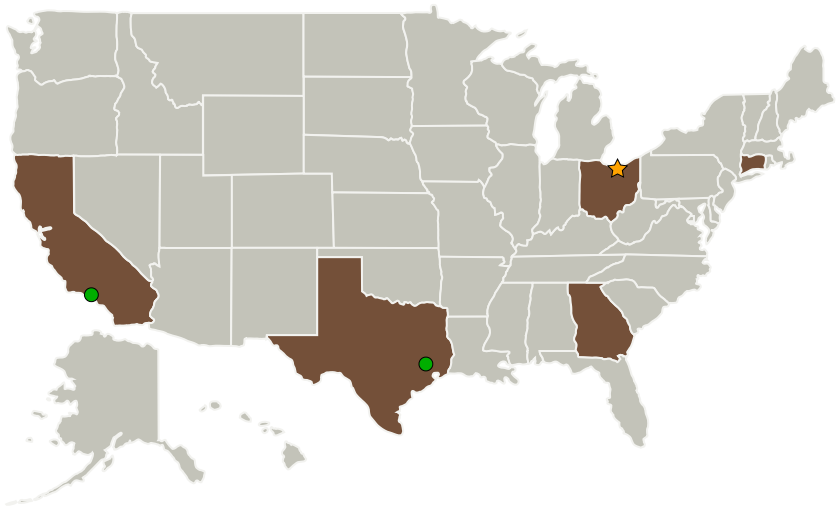
Responsible Program:

Game Changing Development

Advanced Space Power Systems (ASPS): High Specific Energy Li-ion Battery Cells

Completed Technology Project (2011 - 2014)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
●Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
California	Connecticut
Georgia	Ohio
Texas	

Project Management

Program Director:
Mary J Werkheiser

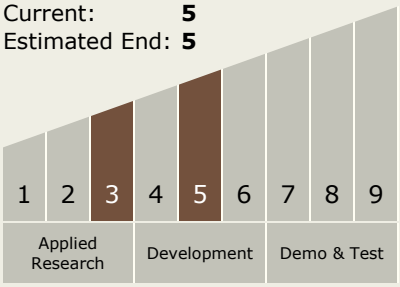
Program Manager:
Gary F Meyering

Project Manager:
John K Lytle

Principal Investigator:
Charles B Taylor

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.2 Electrochemical: Fuel Cells